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Growing Corn

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A WELL-BALANCED SHOCK OF CORN

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N. C. Agricultural Experiment Station, and
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The corn plant is a native of America. It was discovered here and roduced into Europe before the year 1500 by Columbus. Corn is r grown in practically all parts of the world and ranks as the second st important of the world crops, coming next to wheat. In the ted States it more than doubles the wheat crop in both production cash value. The crop might be said to form the very basis of erican agriculture, contributing to the wealth of the farmer through use as (1) an article of human food, (2) as the most generally used l for all kinds of livestock, and (3) as a money crop.

The corn crop in North Carolina, considered from the point of area oted to its culture, holds the first place among field crops. With increased interest in livestock farming it will receive much more ntion in the future than it has in the past. The soil and climatic ditions here are most favorably adapted to corn growing. The long summers and abundant rainfall so well distributed throughout the wing season, together with splendid soils, make this an almost ideal n State. Although the average acre yield in North Carolina is very (18.9 bushels), the highest yields known (100 to 250 bushels per e) have been produced in this section of the country, which proves t the possibilities are great for corn production.

Great opportunities for increasing the average acre yields in North olina are especially available to Corn Club members. In one county re the average acre yield is above the average for the State, being oushels per acre, several boys in the club work in one year reported ds averaging 89 bushels per acre, or over four times as large yields he older farmers, and at the same time they held the cost of pro- tion per bushel at a much lower rate than that of the average farmer the county.

n order to economically increase the yields of corn per acre in the te more attention must be given to the following important factors: Crop rotation; (2) Selecting the soil for corn; (3) Preparation of seed-bed; (4) Fertilizers; (5) Time and rate of seeding; (6) Culti- on; (7) Varieties, and (8) Seed selection.

CROP ROTATION

Planting a single crop on the same soil for a number of years in suc- ion has long been recognized by the best farmers as a means of austing the soil fertility and reducing the crop yields. This is no true with other crops than it is with corn.

REASONS FOR ROTATING CROPS

Some crops draw more heavily upon certain elements of plant f than upon others, in which case there results an unbalanced condi in the elements of plant foods. For instance, corn draws more hea upon the supply of nitrogen than upon the other elements of plant f To correct this unbalanced condition corn should be rotated with s of the leguminous crops, such as the clovers, cowpeas, soybeans, ve beans, alfalfa, vetch and many others, all of which under favorable ditions are capable of adding large quantities of available nitroge the soil. Root crops draw heavily upon the supply of potash and sh be rotated with crops which do well with a much less supply of element.

Many crops, especially the clean cultivated crops, add very li humus (decayed vegetable matter) to the soil. This unfits it for h ing a good supply of moisture and plant foods and leaves it in a po physical condition. These should be rotated with crops which add l quantities of vegetable matter or humus to the soil. In this way soil may be greatly improved, while the area devoted to their produc need not be reduced.

Some crops have most of their heavy feeding roots in the upper la of the soil, while others send many of their heavy feeders down into subsoil for much of their plant food. These should be alternated f year to year, and thus not allow too great a draft upon the sur layers.

There are many other very important reasons why a good worked system of crop rotation should be practiced on every farm; such as, instance, the control of weeds, insects and plant diseases and the e distribution of labor.

If the soil is to remain productive and at the same time give incre yields, a rotation system for every farm must be worked out. In g about this for any given farm, the first thing to do would be to de upon what crops ought to be grown, and then to work out on pap plan which is to be followed for a number of years. It is impossibl say what plan will apply to a given farm unless all of the condit were known. The following rotations have been worked out by C. B. Williams, Chief, Division of Agronomy of this Station, and be of great aid to any one desiring to make a plan for his farm. T rotations are so planned as to include the principles above mentio

SUGGESTED CROP ROTATIONS

Eastern North Carolina

No. 1

First Year—Corn and soybeans or cowpeas, broken in fall and sown in

Second Year—Peanuts, followed by rye or oats at digging time or as soo hogs have eaten waste peanuts.

Third Year—Cotton with rape and crimson clover (white blooming prefer-e) sown between rows at first picking of cotton.

No. 2

First Year—Corn and soybeans or cowpeas, broken in fall and sown in rye oats.
Second Year—Cotton with crimson clover (white blooming preferable) and or oats between rows at first picking.
Third Year—Soybeans or cowpeas, followed by rape and crimson clover.

Piedmont North Carolina

No. 1

First Year—Corn and cowpeas or soybeans deeply broken and sown in rye fall.
Second Year—Soybeans or cotton followed by crimson clover and rye or oats.
Third Year—Soybeans or cowpeas followed by rape and crimson clover.

No. 2

First Year—Cotton followed by crimson clover and rye, oats or barley.
Second Year—Soybeans or peas followed by grain (wheat or oats).
Third Year—Red Clover sown on grain in spring.
Fourth Year—Red clover turned in winter for corn.

No. 3

First Year—Corn and peas followed by oats or wheat, red clover and orchard ass sown on grain in spring.
Second Year—Grain and clover.
Third Year—Clover broken in spring for corn or soybeans.

Mountain North Carolina

No. 1

First Year—Corn followed by crimson clover and oats or rye.
Second Year—Soybeans followed by rape and crimson clover.
Third Year—Clover broken in winter for corn.

No. 2

First Year—Corn followed by rape and crimson clover.
Second Year—Soybeans followed by wheat or oats.
Third Year—Red clover sown on grain in spring.
Fourth Year—Red clover deeply broken in winter.

No. 3

First Year—Corn followed by crimson clover and wheat or rye.
Second Year—Cowpeas followed by rape or crimson clover.
Third Year—Cowpeas or soybeans or corn.

SELECTION OF SOIL FOR CORN

Good yields of corn can be made on almost all soils of the State, has been shown in actual practice. However, the land best suited corn production is a fertile, mellow, well-drained soil containing a g supply of decayed vegetable matter or humus. While the loamy s (those containing a mixture of sand and silt), as a rule, produce best yields. The stiffer clays and sandy soils produce well when m aged properly.

Good drainage is absolutely necessary for a soil to be productive. T benefits of good drainage are: (1) Causes the land to warm up ear in the spring; (2) reduces the tendency to bake and increases the mo ure holding capacity of the soil by improving the physical condit letting the air into the soil and permitting the roots to penetrate greater depths; (3) renders the plant food more available, and (4) proves the life of the soil.

A good supply of humus is absolutely necessary for a soil to be nomically productive. This humus can be supplied to the soil either making a good application of stable or barnyard manure or by turn under cover crops, as will be done where a good rotation of crop practiced.

The benefits of humus are twofold. First, it improves the soil making it more fertile, being itself a source of plant food, especi rich in nitrogen, and rendering other elements of plant food in the more available. Second, humus makes the soil mellow, making stiff lands more loose and friable and the sandy soils more compact. O benefits are: (1) Makes the average well-drained soil darker and, th fore, warmer in the early spring; (2) supports bacterial life in the and (3) reduces the amount of soil moisture lost by evaporation, ac like a sponge to absorb and retain the moisture until needed by plants. The ability of humus to retain soil moisture is very import for the corn crop, as this plant requires such a large amount of w to produce well. As has been proved by accurately conducted exp ments, from 300 to 500 pounds of water are required to produce pound of dry plant matter. The corn plant is a vigorous feeder rapid grower and all of its food taken from the soil has to be in a s tion. This should show something of the importance of an abund moisture supply for the corn plant.

PREPARATION OF THE SEED-BED

The time and depth of breaking corn land and the later treatment depend much upon the nature of the soil and subsoil and upon the vious treatment of the land. Much of this will have to be determi by one's own judgment and not fixed by any set of rules. Deep br ing should always be one of the first requisites for corn land. L

)uld be broken to a greater depth by one to two inches per year until lepth of from eight to ten inches has been reached. Some lands need be subsoiled once in a few years to keep the hard pan broken and to .ke room for deep root penetration and provide a reservoir for a ge supply of soil moisture. Lands that are broken deeply seldom fer from drought, while lands broken from two to five inches nearly vays give poor yields in dry years.

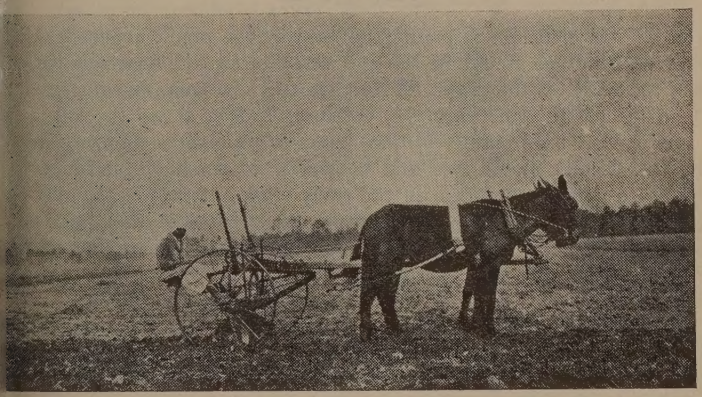


Fig. 1.—Preparing a good seed-bed and saving moisture.

Fall breaking is very important, but the crop rotation practiced and ne other factors will determine whether this is practical. Especially fall breaking important with the stiffer clayey soils or those which :e a stiff clay subsoil near the surface, unless it be a soil where great s would result from washing during the winter months. However, p plowing often prevents washing by enabling the land to absorb l retain the rain water that falls.

Where fall breaking is practiced it is a splendid idea to sow the land vn in a cover crop to protect the soil during the winter months. ep breaking in the spring should be done at as early a date as is ictical, and no matter *when done this should be followed by the disc row and later with the smoothing harrow to thoroughly pulverize soil.* Frequent use of a smoothing harrow from the time the land disked will enable the soil to conserve the moisture supply and will ve more important perhaps than any later cultivation which may be en after the crop is planted.

t might be added that on some soils where the land is subject to over- v the practice is to plow up the land into beds and to plant the corn the bed. While in some other sections where corn is subject to in- y from drought during the late summer months the practice is to

throw out deep furrows between the beds in which the corn is plant Under either of these conditions the principles of deep breaking a surface cultivation for giving thorough preparation are the same. to whether some other method for solving these conditions could not devised is a question, but at the present the best plan will be to foll with perhaps slight modifications, the best practice used in your co munity.

FERTILIZERS

Of the ten elements of plant food used by the plant, generally all three or four are found in the soil and air in sufficient quantities meet the needs of the plant. These are (1) nitrogen, (2) phosphoro (3) potash, and, sometimes, (4) calcium (lime).

Nitrogen is used mainly by the plants to produce a vigorous, healt growth of stalk and leaves and to give a good color; phosphorous produce a good root system in the early stages of growth, to make a mature the seed, and give good body to the plant; potash largely to the plant in carrying on its normal work; calcium to neutralize sweeten an acid or sour soil and to improve the physical condition all soils.

Lime should be supplied to the soil where necessary in the form ground limestone (about two tons per acre), or some other form of li to the legume crops which come in the rotation with corn.

Most of the soils found in the piedmont and mountain sections North Carolina contain a fair amount of potash, and at the pres prices its general use can hardly be recommended for corn. The use cover crops to be turned under and the application of lime to keep land sweetened will serve to some extent probably to render the pot in the soil available to the crops and make it unnecessary to apply commercial forms of potash. Kainit, muriate of potash, sulphate potash are the common forms on the market in normal times. W ashes also are used as a potash fertilizer.

The supply of phosphorous in the soils of North Carolina is co paratively limited and must be supplied in commercial form if the l returns are to be had. Fortunately this plant food costs less than o fourth as much per pound as does either potash or nitrogen. Ph phorous is obtained from bones and phosphate rocks. Bone meal (fin ground bones), acid phosphate (finely ground phosphate rock that been treated with sulphuric acid), raw rock phosphate (that which not been treated with sulphuric acid), and basic slag or Thomas ph phate (a by-product in manufacture of steel), are the commercial fo of phosphorous. This element of plant food is very important and m be supplied in a commercial form, and the most generally used form the 16 per cent acid phosphate.

Nitrogen, the most expensive and as a rule the most deficient of

ıe elements of plant food in the soil, can be supplied by growing legume ·ops such as clovers, cowpeas, soybeans, velvet beans, alfalfa, vetch and ther crops belonging to the legume family of plants. The peculiar ıing about the plants belonging to this family is that, under favorable ·onditions, bacteria are supported on their roots. These bacteria are apable of taking in free nitrogen from the atmosphere and fixing it in ıe soil in a form that is available to the crops which follow. The lants belonging to this family are valuable for other reasons, but if ıey were to be considered solely upon their value for aiding in the fix- ıg of nitrogen in the soil they would form one of the most important roups of plants. This peculiarity is not common to any other group. 3ut until this important method for securing cheap nitrogen comes into ıore general use it will be necessary to use the expensive commercial orms of nitrogen in order to get profitable returns from the land.

Some of these commercial forms of nitrogen are (1) animal products: neat scrap, fish scrap, dried blood and tankage; (2) plant products: ottonseed meal, lintseed meal and tobacco scrap; (3) the mineral forms: ıitrate of soda, sulphate of ammonia, potassium nitrate, and some others ıot in very general use.

Now, in suggesting fertilizer mixtures for the soils of North Carolina t must be remembered that there are three distinct soil types in the State. That which would prove suitable for the coastal section might ıot be at all fitted to the piedmont and mountainous sections. At the same time it should be kept in mind that not only must the needs of the plant and the relative amounts of plant foods found in the soil be considered, but the price of the fertilizer to be used and the prevailing price of the crop product must determine what fertilizers and the quantity of those fertilizers that are to be recommended. In other words, when the price of fertilizers is normal, as before the war, larger quantities of potash, for instance, could be recommended than would be at all advisable under the present conditions. However, a reasonably liberal use of fertilizers on most soils does pay, and where large yields are to be expected, unless the soil is in very unusual condition as regards fertility, commercial fertilizers must be applied. The following mixtures for the different crops in the sections indicated are recommended by Mr. C. B. Williams, Chief, Division of Agronomy of this Station:

For Piedmont Section

For Small Grains, Grasses and Corn.—Two hundred to 400 pounds per acre of a mixture analyzing 10 to 12 per cent phosphoric acid and 3 to 4 per cent nitrogen.

For Leguminous Crops.—Two hundred and fifty to 500 pounds per acre of 16 per cent acid phosphate. On the poorer soils add enough cottonseed meal, dried blood, fish scrap or some other nitrogenous carrier to supply 1 to 2 per cent nitrogen.

For Cotton.—Four hundred to 800 pounds per acre of a mixture analyzing about 10 to 12 per cent phosphoric acid and 2 to 3 per cent nitrogen.

For Coastal Plain Section

For Oats, Grasses and Corn.—Two hundred and fifty to 400 pounds per ac of a mixture analyzing 6 to 8 per cent phosphoric acid and 4 to 6 per ce nitrogen.

For Leguminous Crops.—Two hundred to 400 pounds per acre of 16 per ce acid phosphate. On the poorer soils add enough cottonseed meal, dried bloo fish scrap or other nitrogenous carrier to supply 1 to 2 per cent nitrogen.

For Cotton.—Four hundred to 800 pounds per acre of a mixture analyzi 7 to 8 per cent phosphoric acid and 4 to 6 per cent nitrogen.

For corn it may be a good plan, especially on light soils, to apply a part the nitrogen-carrying fertilizers at one of the later cultivations. This is pa ticularly true if nitrate of soda is used.

TIME AND RATE OF SEEDING CORN

The more nearly the whole of the growing season is used by the co crop in making its growth, the greater the yield. This would indica a preference for early planting. However, there are certain factors the soil condition, both in preparation and temperature as well as i sects, which may completely change this principle and make it far bett to plant relatively late than early. Never plant corn in land that h not been thoroughly prepared by deep breaking, disking and surfa harrowing to thoroughly pulverize all clods and turfs. It is far mo profitable to defer planting and to give this cultivation, which will more real good for the crop that is to follow, than to plant corn wi the intention of preparing the land at a later date. Before planting s that the soil is warm enough to germinate the seed and to bring t plants right up so that they will grow off immediately. This will enab them to escape injury by cutworms and other insects and often make second planting unnecessary.

The rate of seeding should be determined by the fertility of the so the amount of manure, the fertilizers used, and the variety of co grown. The largest individual acre yields made in the South duri the past few years were made not by prolificacy so much as by increas numbers of plants per acre. To be sure, the more prolific varieti should not be planted as thickly as the single-eared varieties. The mo fertile the soil and the greater the amount of fertilizers used the thick the corn may be planted. It is impossible to say definitely just ho thick the corn of each acre should be planted in that the conditions va so widely. However, the importance of thick planting and the maki of the conditions such as to support the stand left is very importa indeed.

It is now considered a waste of time and labor to check corn unle very unusual conditions prevail. The drilling of the seed will allo any desirable adjustment of the thickness by regulating the distan between the hills in rows from three and a half to five feet apart, fo being a very good width for the rows as it allows good working distanc

On club acres it will be found a good idea to plant the seed much thicker than it is desirable to have the plants remain. This will permit the elimination of the inferior plants and insure a perfect stand after the danger of insects is past. A very important precaution is not to leave a thicker stand than the moisture supply will support during the latter stages of growth.

CULTIVATION

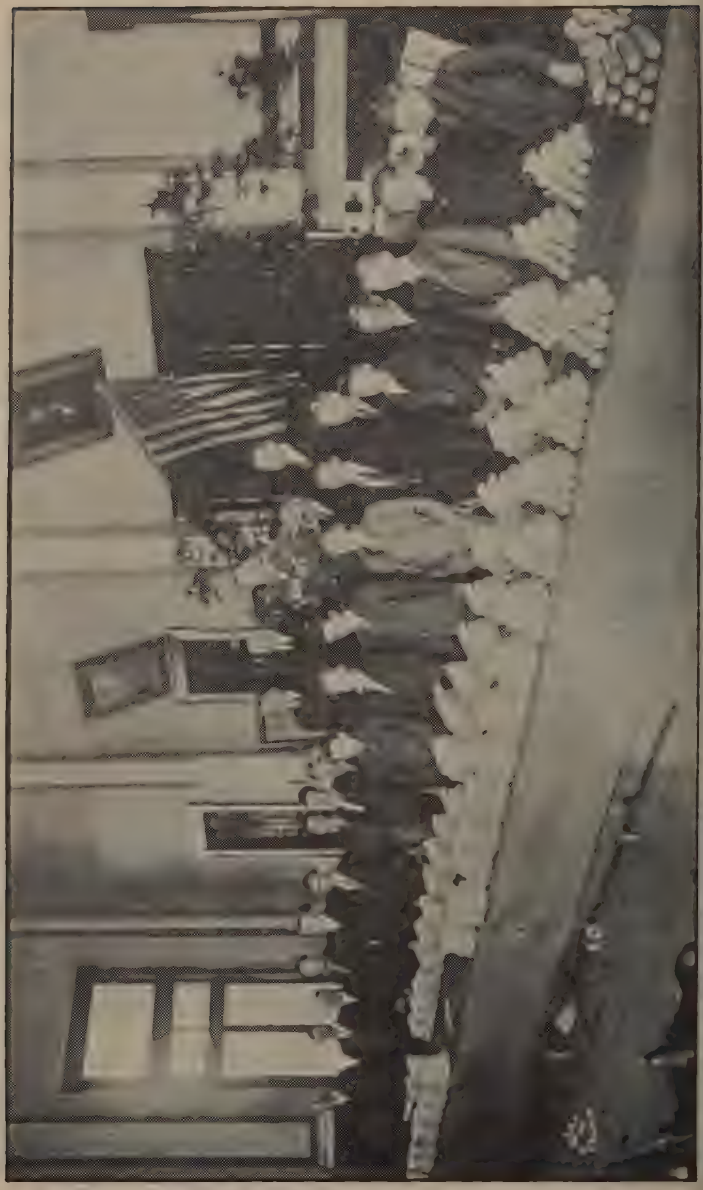
Frequent shallow cultivation has been practiced for such a long time by the most successful club members and farmers of this State that the wisdom of the practice is now very generally recognized, though not too generally practiced. *This practice conserves the soil moisture, renders the plant food available, ærates the soil, and kills weeds before they get a firm hold.* Shallow cultivation should be begun very early, by the time the corn is up or before, and be continued until all necessity for its benefits are passed. The first one or two cultivations may be given with the weeder or with a light section harrow, and the latter ones with the cultivator. Where other than level cultivation is practiced it may be best to use some other implement more adapted to the conditions.

Corn should never have deep cultivation as it must be kept constantly in mind that the main feeding roots of the corn plant often run for a distance of many feet in the upper layers of soil near the surface. To give deep cultivation means that many of the important roots surely will be pruned severely and the growth of the plants greatly checked. Give all deep cultivation before planting, and after planting give shallow cultivation. *"Laying by"* corn should not be in a club member's practice. Cultivate as long as the benefits are not more than counteracted by the damage done to the plants.

VARIETIES

The corn yields for North Carolina can be greatly increased simply by selecting the varieties which give the highest yields of good corn per acre for the different sections of the State. The Experiment Station has been conducting variety tests with corn for the past several years and is in a position to furnish the growers with reliable information relative to the yields of varieties of corn on the different soil types and climatic conditions in this State. Large numbers of varieties have been tested and the names of a few of the best yielding varieties for the different stations are given below.

It is very important *that the acre of corn grown by the club member should be the source of good seed corn for the farm on which it is grown, and even for the community.* Therefore, nothing but the very best variety for the community should be used in this work. Such a variety will not only prove more productive, but it will also be in great demand.



This corn should be exhibited at the community and county fairs, and in bringing it before the people of the community in this manner much of the crop may be sold for seed in the community in which it is grown. It would mean much to the welfare of the State to have every community growing one pure-bred variety of corn that is best adapted to the soil and climatic conditions of that community. Look at the lists given below and see what variety is recommended for the conditions most similar to yours and secure good seed of the first variety named for your acre.

Buncombe Branch Station, Swannanoa, N. C.

First Generation Cross No. 182
Weekley's Improved
Southern Beauty
Latham's Double

Iredell Branch Station, Statesville, N. C.

Southern Beauty
Jarvis' Golden Prolific
Biggs' Seven Ear
Latham's Double

Granville Branch Station, Oxford, N. C.

Biggs' Seven Ear
Batts' Four Ear
Latham's Double
Deaton's

Central Station, Raleigh, N. C.

Biggs' Seven Ear
First Generation Cross No. 182
Southern Beauty
Weekley's Improved

Edgecombe Branch Station, Rocky Mount, N. C.

Biggs' Seven Ear
Latham's Double
Goodman's Prolific
Coker's Williamson

Washington Branch Station, Wenona, N. C.

Latham's Double
Horse Tooth
Wannamaker
Coker's Williamson

SELECTION OF SEED

The easiest way to increase corn yields is by careful, judicious seed selection. Seed corn selection is an art based upon the law of heredity, that "Like produces like." To become an expert in selecting good seed corn requires considerable study and practice, although any one by giving some attention to this work may become fairly good at it.

The general custom has been to select large, sound ears from the crib at planting time. This is done without any regard to the number of ears that were borne on the mother plant, without any regard to the character of the plant upon which the ear was produced, and without any regard to the number of barren stalks adjacent to which it was borne. The pollen from these barren stalks might easily have been that which pollinated the kernels of the ears selected. Such a practice can never mean improvement, and if kept up here North Carolina will always have a low acre yield of corn, no matter how much attention may be given to the other important phases of the work in corn production.

PLACE OF SELECTION

Seed corn should be selected in the field at about the time the ear begin to mature, when the husk has begun to turn yellow and before th leaves are dead. In all of the work of selection there must be a stand ard, an ideal, and all of the selections must be made to conform to th standard. If the selections do not conform to the standard—that i they are not similar to the ideal—that important character, *uniformity* cannot be attained.

FIG. 3.—Students selecting good seed corn at State College.

In selecting plants from which seed are to be saved, stalks of mediu height having from twelve to fourteen well-developed leaves and a goo root system, especially with good brace roots, should be selected. I should be settled in the outset as to how many ears should be on a stal and no other stalks than those having this exact number of well-grow ears should be selected. For instance, this Station has found that tw good ears to each stalk will give a better yield, other things being equa than one bearing a larger number of nubbins, as is so often the cas with the many-eared corns. The ears should be borne at a uniform heighth on the stalk as this permits more complete pollination than whe they are borne at different heights. It is very desirable that the shan should be of medium size and length, allowing the ear to droop afte maturity, and thus preventing the damage from bad weather condition The husks should be long enough to completely cover the tips of the ear Barren plants produce pollen which can pollinate the kernels of goo plants, thus producing a tendency towards barrenness, and for this rea son the tassel of the barren plant should be broken out as soon as i appears. It is not always easy to detect the stalk which is likely to b

arren at this period of its growth. If a barren plant is allowed to oduce a tassel no seed plants should be selected near it.

The plants having these desirable characters: *Medium heighth, well-veloped root system, right number of ears, covered with good husks, id borne on a shank of medium size and length to permit necessary ooping* of ear, should be marked with a white cloth string tied about ie ear (or something answering the same purpose), and allowed to main in the field until they are thoroughly matured. Do not cut the ps, pull the fodder, or cut and shock these selected plants. Leave them anding until they are thoroughly matured if the weather conditions ill permit. Then pull the ears and store them away in a dry place here the changes in temperature and moisture conditions are neither cessive nor sudden.

In the spring the ears should be husked and only the ones having esirable characteristics—those qualities which indicate a large percent-ge of shelled corn to cob—should be used for seed.

CHARACTER OF EAR

Shape.—The cylindrical ear is the most desirable type, as it is gener-lly supposed to give the greater proportion of grain to cob. The cylin-rical shaped ear is one that tapers slightly toward the tip, carrying ull size clear out to the tip of the ear. The rows of kernels should be raight and parallel for the full length of the ear without much dimin-shing in the size of the kernels or any dropping out of rows of kernels ear the butt or tip of the ear.

Maturity.—Maturity is generally shown by brightness of color and lumpness of the kernel. Immaturity is shown by shriveled, poorly olored kernels attached loosely to the cob. Good maturity is important s it is necessary for good germination and strong growth of young lants.

Purity.—Purity is shown by the color of the kernels and cobs. In hite varieties any mixture with yellow varieties will be shown by ellow-sided kernels and yellow varieties show a mixture of white in aving white-capped kernels. Yellow varieties should always have a eep red cob, and while a few white varieties have red cobs they are either desirable nor common, and a red cob in white varieties is nearly lways indicative of impurity.

Length and Circumference.—The length to circumference should be bout as 4 is to 3—that is, if the ear is eight inches long the circumfer-nce should be about six inches. The circumference is measured at bout one-third the way from the butt to the tip. This seems to be the roportion which gives the greatest amount of shelled corn to cob.

Butts and Tips.—The more completely the butts and tips are filled

out with good-sized, well-shaped kernels the greater the percentage shelled corn to cob.

Space Between the Rows of Kernels.—Deep spacing between the ke nels either at the crown or between the kernels near the cob is ve undesirable as it makes a lower percentage of grain to cob.

Shape and Uniformity of Kernels.—Generally the shape of the kern to give the greatest amount of grain to cob should be that common known as the wedge shape, having straight sides and not rounded ne the crown. The thickness at the crown and tip should not vary, but of uniform thickness clear to the cob. Uniformity in the size and sha of the kernels is a very important factor. It is found only where t rows are carried completely out to the ends of the ear and where t rows are straight and is usually associated with the highest proporti of grain to cob.

Size of Cob.—The cob should be of medium size as a large cob us ally means short kernels, and a cob that is too small means that the will be too few rows of kernels.

SELECT GOOD SEED EACH YEAR

Make it a practice to select good seed from the field each year. not only increases the yield, but furnishes pure-bred seed which can sold at a greater profit.